BUREAU OF RECLAMATION

2022 Colorado River Annual Operating Plan

Colorado River Management Work Group

Final Consultation

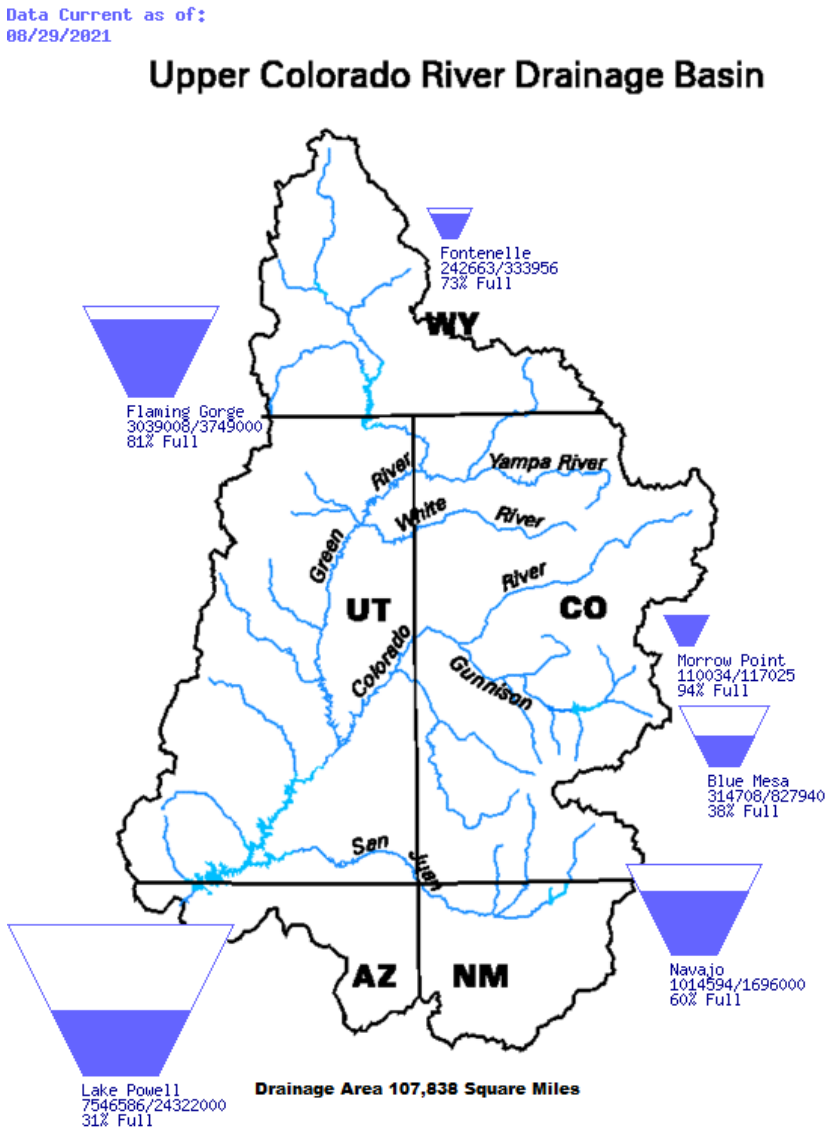
August 31, 2021

Upper Colorado Basin

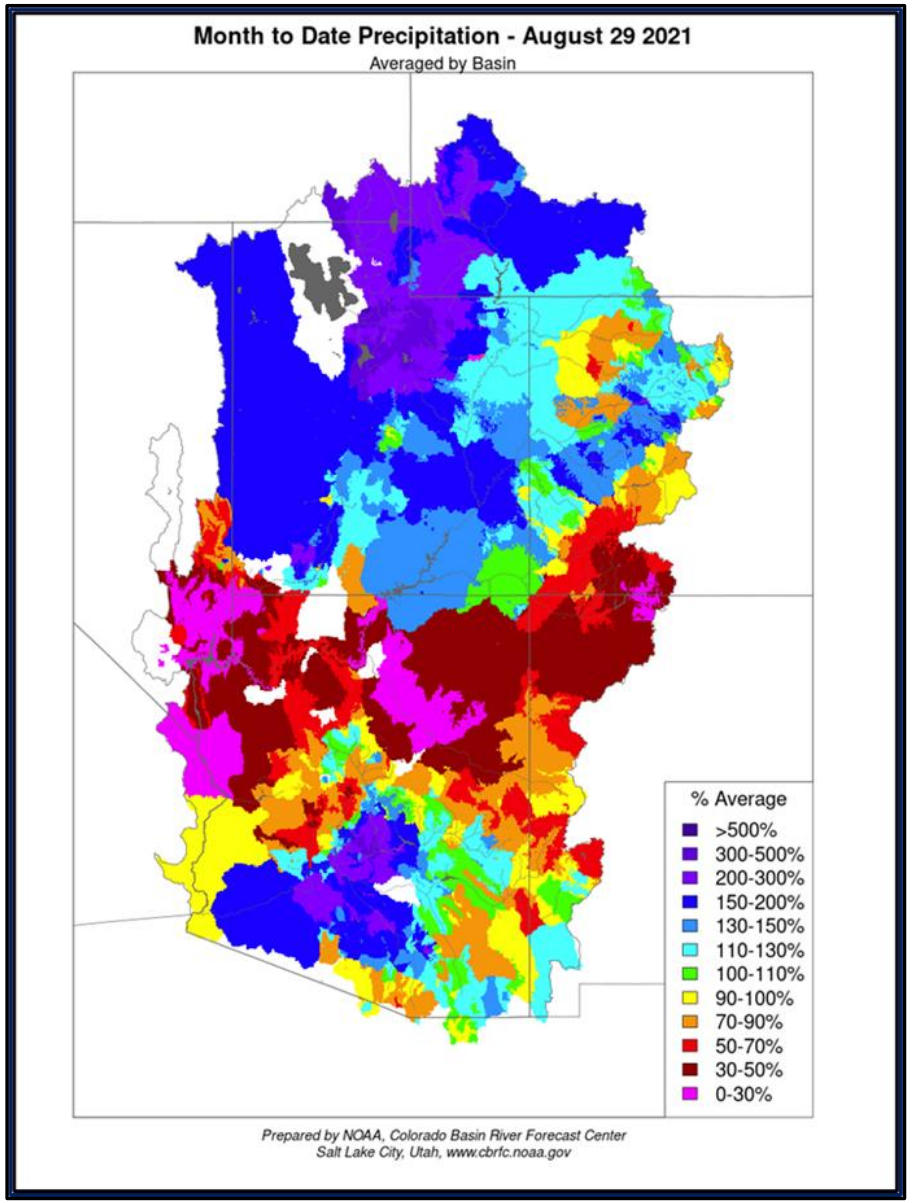
Water Year 2021 Hydrology

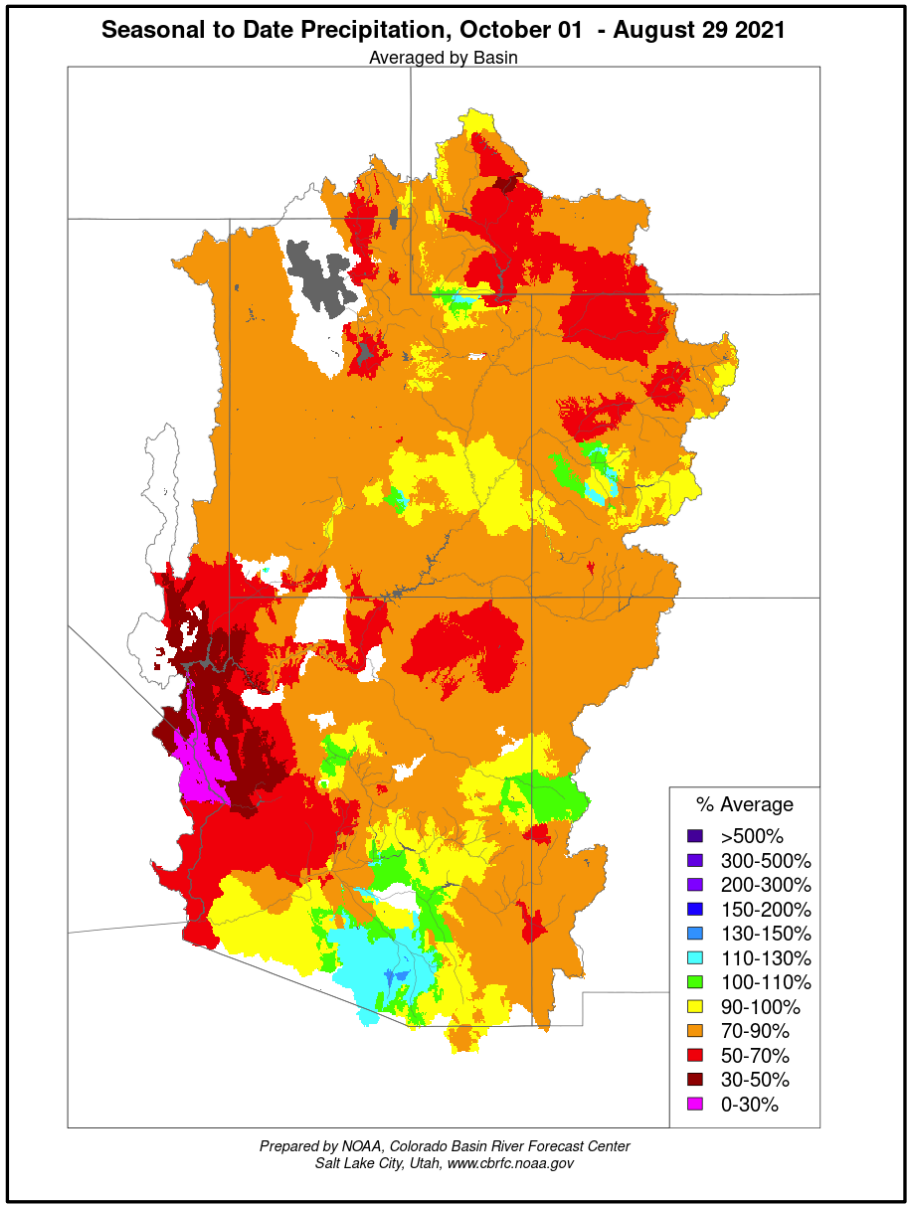
Upper Basin Storage (as of August 29, 2021)

Reservoir	Percent Current Live Storage	Current Live Storage (maf)	Live Storage Capacity (maf)	Elevation (feet)
Fontenelle	73	0.24	0.33	6,493.62
Flaming Gorge	81	3.04	3.75	6,021.67
Blue Mesa	38	0.31	0.83	7,450.98
Navajo	60	1.01	1.70	6,030.60
Lake Powell	31	7.55	24.32	3,549.46
UC System Storage	40	12.30	31.09	

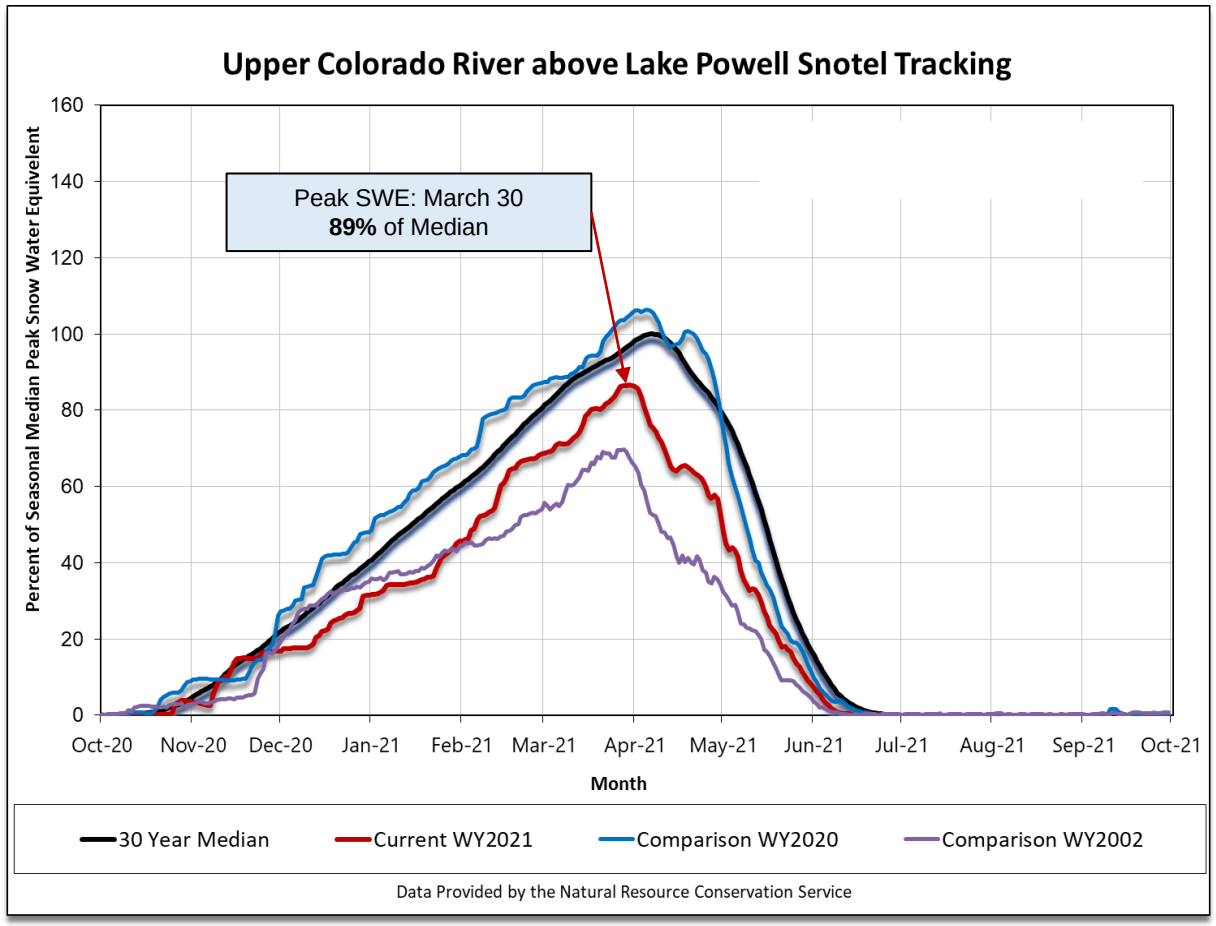


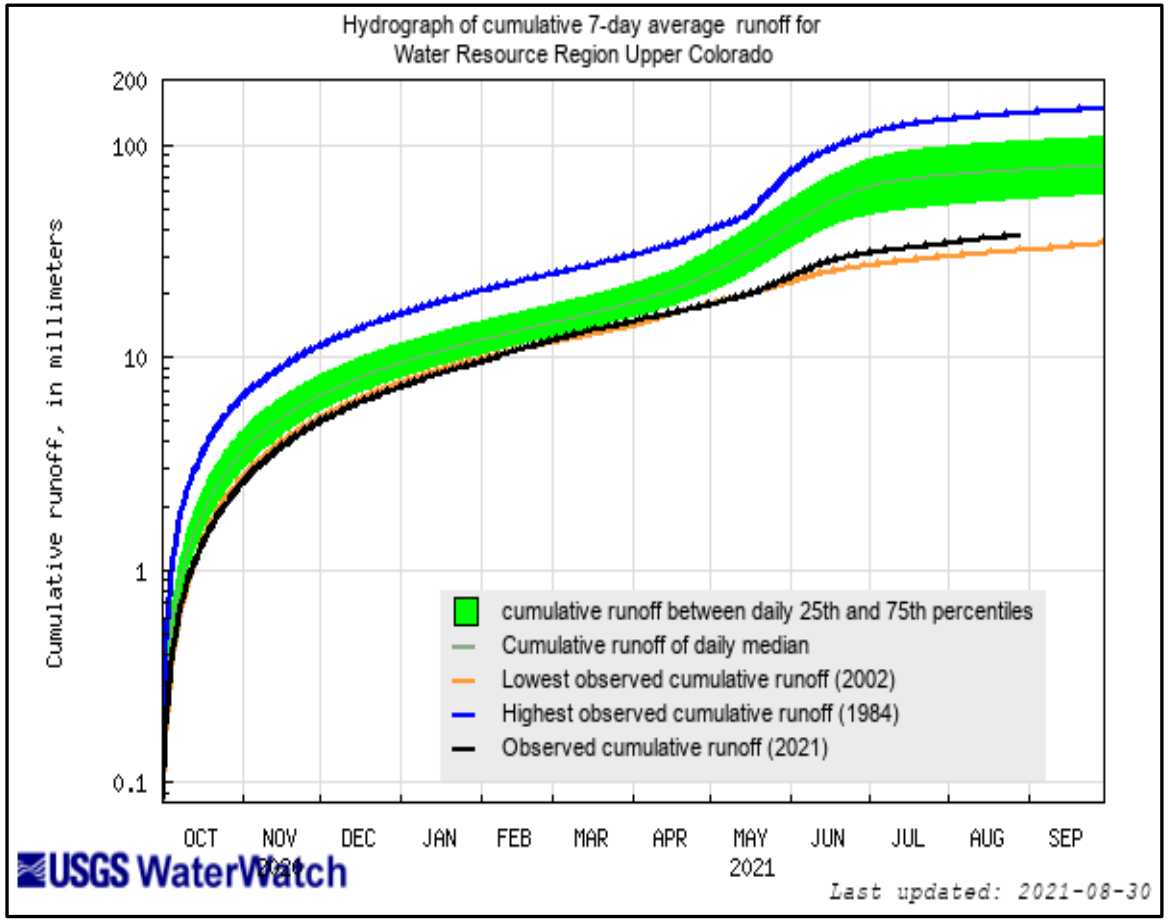
Precipitation: August and Seasonal





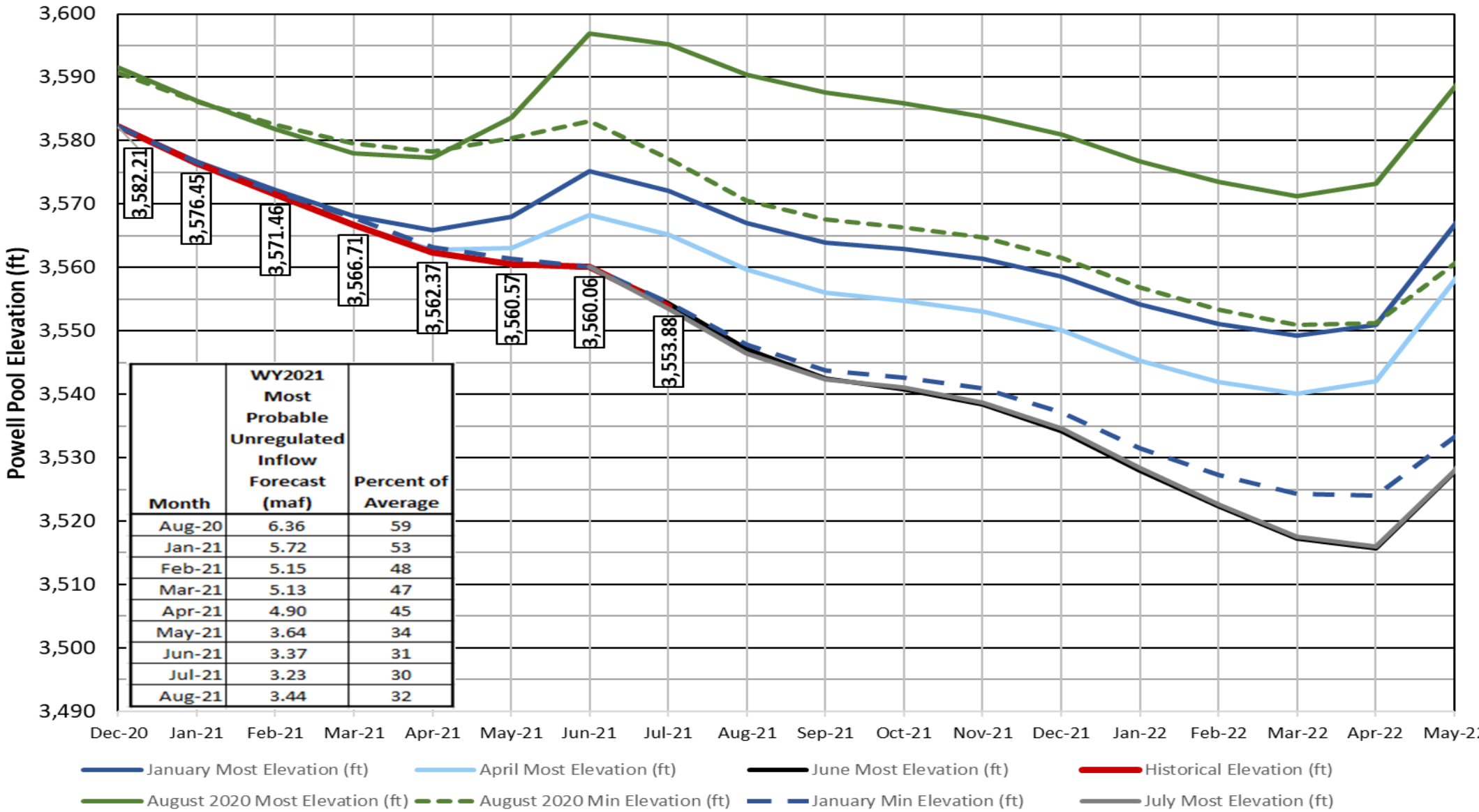
Current SWE and Observed UC Runoff





Available online at: https://waterwatch.usgs.gov/index.php?id=wwdur_cumrunoff

Lake Powell 24-Month Study Most Probable Elevation Projections
August 2020 through July 2021



Month	WY2021 Most Probable Unregulated Inflow Forecast (maf)	Percent of Average
Aug-20	6.36	59
Jan-21	5.72	53
Feb-21	5.15	48
Mar-21	5.13	47
Apr-21	4.90	45
May-21	3.64	34
Jun-21	3.37	31
Jul-21	3.23	30
Aug-21	3.44	32

Most Probable August Forecast Water Year 2021

April – July 2021 Observed Unregulated Inflow

as of August 2, 2021

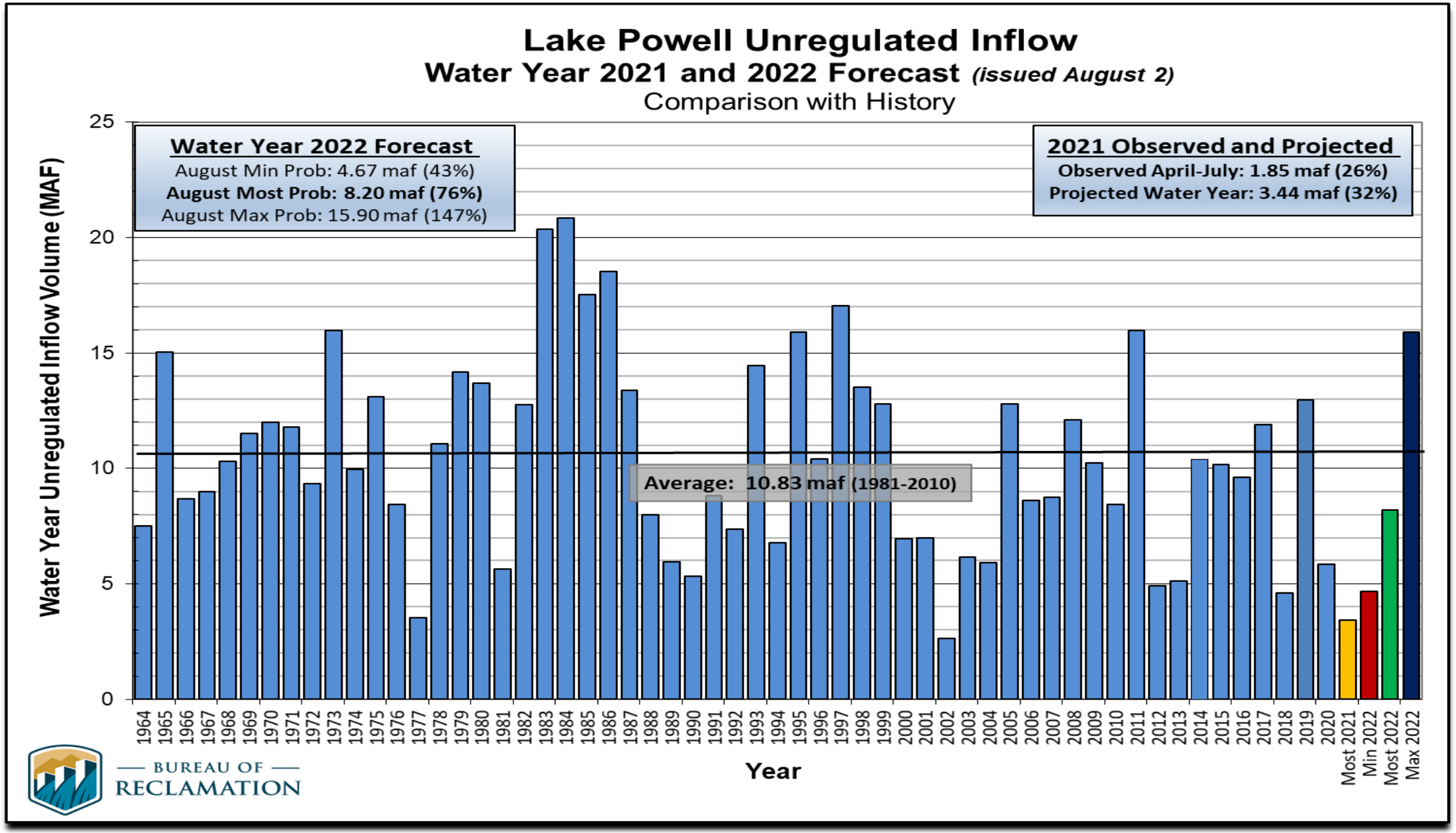
Reservoir	Unregulated Inflow (kaf)	Percent of Average[1]
Fontenelle	318	44
Flaming Gorge	380	39
Blue Mesa	317	47
Navajo	378	51
Powell	1,850	26

Water Year 2021 Forecasted Unregulated Inflow

as of August 2, 2021

Reservoir	Unregulated Inflow (kaf)	Percent of Average[1]
Fontenelle	552	51
Flaming Gorge	649	45
Blue Mesa	519	54
Navajo	504	47
Powell	3,437	32

[1] *Percent of average is based on the period of record from 1981-2010.*


Lake Powell Unregulated Inflow
Water Year 2021 and 2022 Forecast (issued August 2)
Comparison with History
Water Year 2022 Forecast
August Min Prob: 4.67 maf (43%)
August Most Prob: 8.20 maf (76%)
August Max Prob: 15.90 maf (147%)
2021 Observed and Projected
Observed April-July: 1.85 maf (26%)
Projected Water Year: 3.44 maf (32%)
Average: 10.83 maf (1981-2010)
Water Year Unregulated Inflow Volume (MAF)
Year
0
5
10
15
20
25
1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020
Most 2021
Min 2022
Most 2022
Max 2022
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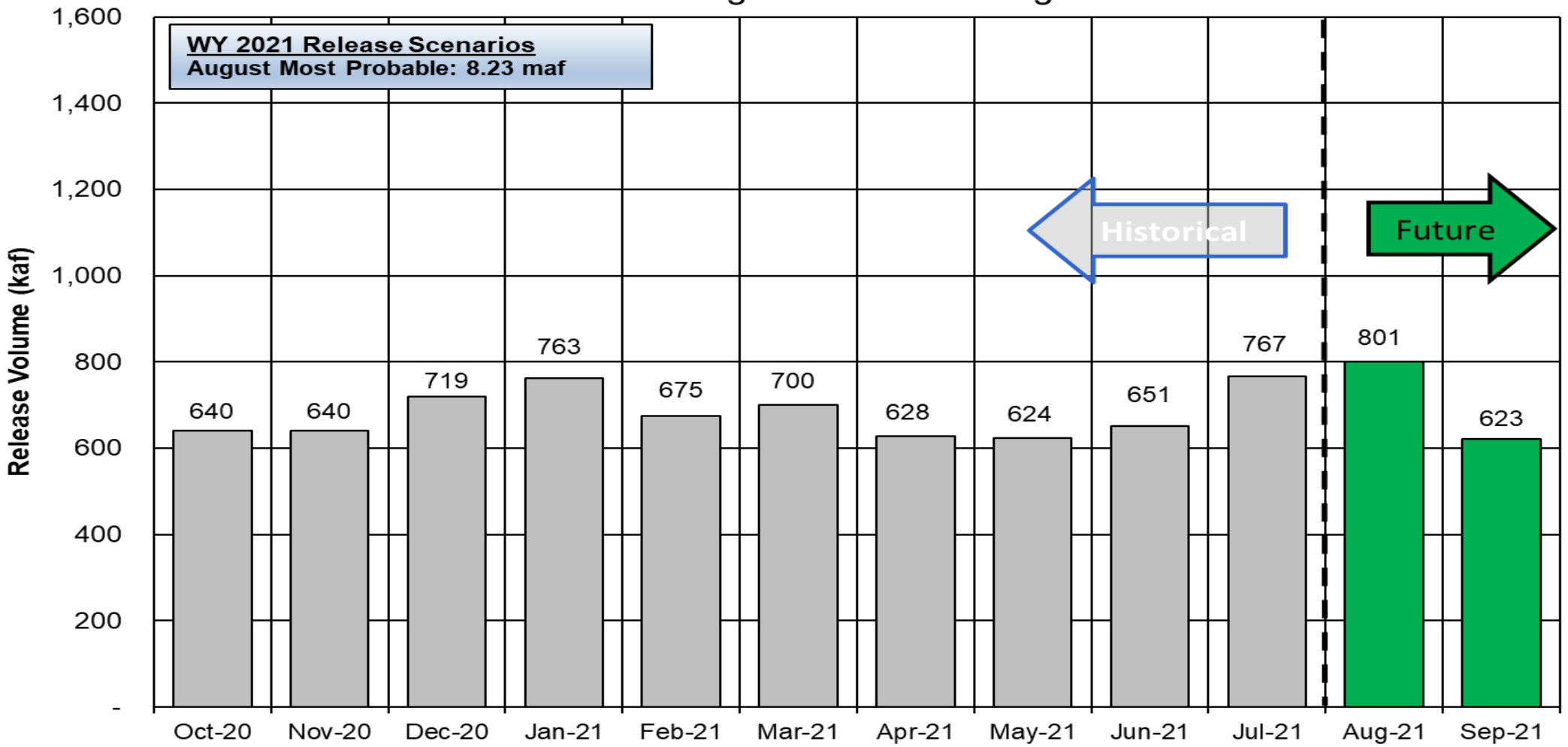
Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2021

Based on August 2021 Modeling



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The Drought Response Operations Agreement (DROA) can be found here: https://www.usbr.gov/dcp/finaldocs.html

Upper Colorado Basin

Projected Operations for Water Year 2022

2021 DROA Timeline of Events

- January 2021: Minimum Probable 24 Month Study run projected Powell below 3,525’
  - Formal notification to parties
  - Enhanced monitoring and coordination
  - Monthly analysis of min/most/max
- May 2021: Most Probable 24 Month Study run projected Powell within inches of 3,525’
  - DROA planning formally initiated
- July 2021: Continued declining hydrology and declining Powell
  - Consultation and initiation of DROA releases under emergency provision of agreement

Upper Basin DROA Initial Unit Drought Response Releases that started in July 2021

- July WY2021 forecast decreased 140 kaf from the June forecast
- Continued drought conditions exacerbated already parched soil moisture conditions
- WY2022 most probable forecast decreased 1.84 maf (17%)
- Prospects of future monsoon events unknown

DROA Releases for the July 24MS Model Run

	Jul	Aug	Sep	Oct	Nov	Dec	
	(kaf)	(kaf)	(kaf)	(kaf)	(kaf)	(kaf)	Sum
Flaming Gorge	13	42	43	27	0	0	125
Blue Mesa	0	14	18	4	0	0	36
Navajo	0	0	0	0	10	10	20
Sum:	13	56	61	31	10	10	181

Lake Powell & Lake Mead Operational Table

Lake Powell Operating Tier for Water Year 2022[1]

Lake Powell			Lake Mead		
Elevation (feet)	**Operation According to the Interim Guidelines**	**Live Storage (maf)[1]**	**Elevation (feet)**	**Operation According to the Interim Guidelines**	**Live Storage (maf)[1]**
3,700	**Equalization Tier** Equalize, avoid spills or release 8.23 maf	24.3	1,220	**Flood Control Surplus or Quantified Surplus Condition** Deliver > 7.5 maf	25.9
3,636 - 3,666 (2008-2026)	**Upper Elevation Balancing Tier[3]** Release 8.23 maf; if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf	15.5 - 19.3 (2008-2026)	1,200 (approx.)[2]	**Domestic Surplus or ICS Surplus Condition** Deliver > 7.5 maf	22.9 (approx.)[2]
			1,145		15.9
			1,105	**Normal or ICS Surplus Condition** Deliver ≥ 7.5 maf	11.9
3,575		9.5	1,075		9.4
	Mid-Elevation Release Tier Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf			**Shortage Condition** Deliver 7.167[4] maf	
	3,535.40 ft Jan 1, 2022 Projection		1,050		7.5
3,525		5.9		**Shortage Condition** Deliver 7.083[5] maf	
	Lower Elevation Balancing Tier Balance contents with a min/max release of 7.0 and 9.5 maf		1,025		5.8
3,490		4.0	1,000	**Shortage Condition** Deliver 7.0[6] maf Further measures may be undertaken[7]	4.3
3,370		0	895		0

Diagram not to scale

[1] Acronym for million acre-feet

[2] This elevation is shown as approximate as it is determined each year by considering several factors including Lake Powell and Lake Mead storage, projected Upper Basin and Lower Basin demands, and an assumed inflow.

[3] Subject to April adjustments which may result in a release according to the Equalization Tier

[4] Of which 2.48 maf is apportioned to Arizona, 4.4 maf to California, and 0.287 maf to Nevada

[5] Of which 2.40 maf is apportioned to Arizona, 4.4 maf to California, and 0.283 maf to Nevada

[6] Of which 2.32 maf is apportioned to Arizona, 4.4 maf to California, and 0.280 maf to Nevada

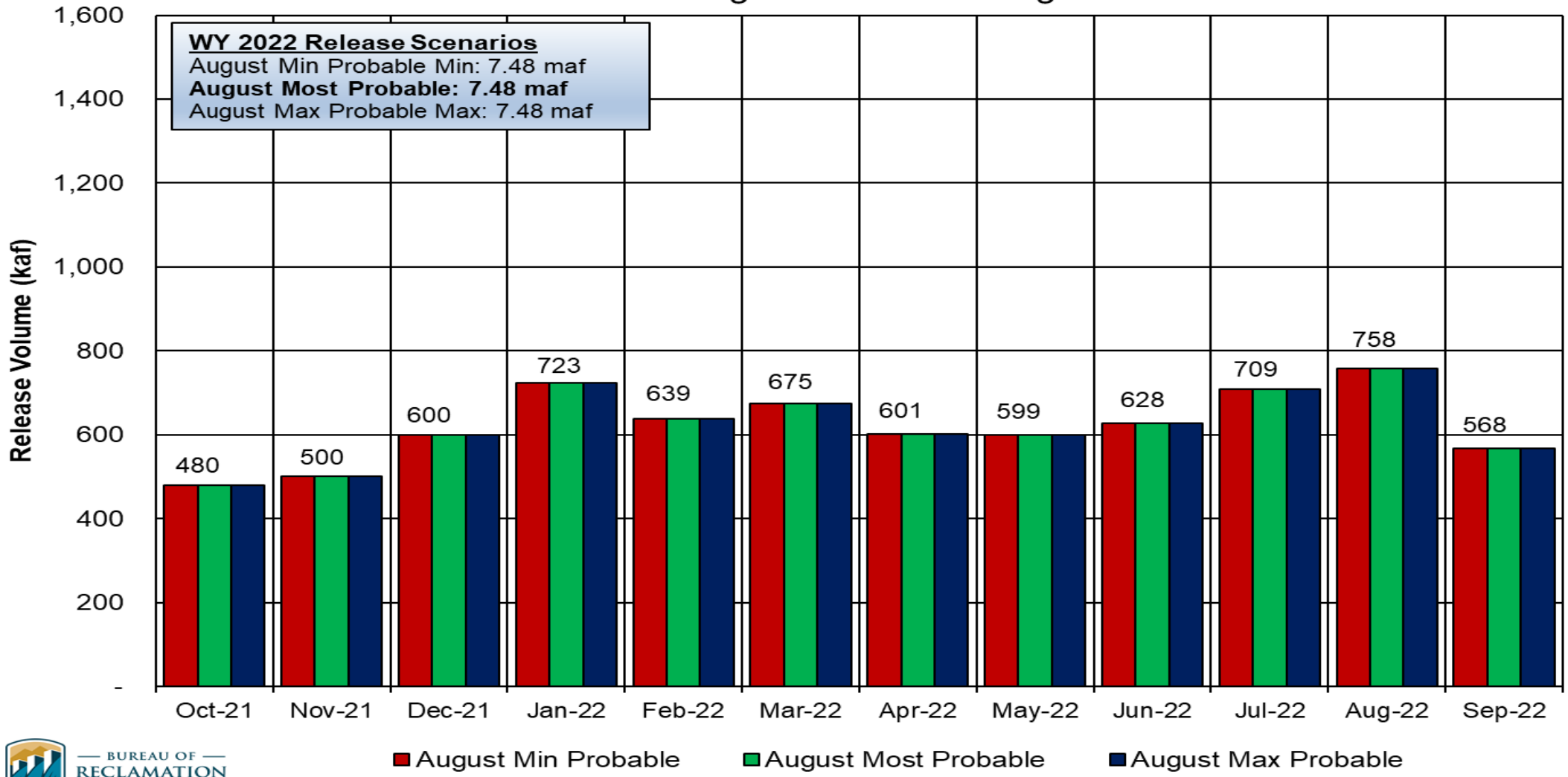
[7] Whenever Lake Mead is below elevation 1,025 feet, the Secretary shall consider whether hydrologic conditions together with anticipated deliveries to the Lower Division States and Mexico is likely to cause the elevation at Lake Mead to fall below 1,000 feet. Such consideration, in consultation with the Basin States, may result in the undertaking of further measures, consistent with applicable Federal law.

[1] **Lake Powell operating determinations are based on August 2021 Most Probable 24-Month Study projections consistent with the 2007 Interim Guidelines and 2019 Drought Contingency Plans.**

Potential Lake Powell Monthly Release Volume Distribution

Release Scenarios for Water Year 2022

Based on August 2021 Modeling



BUREAU OF RECLAMATION

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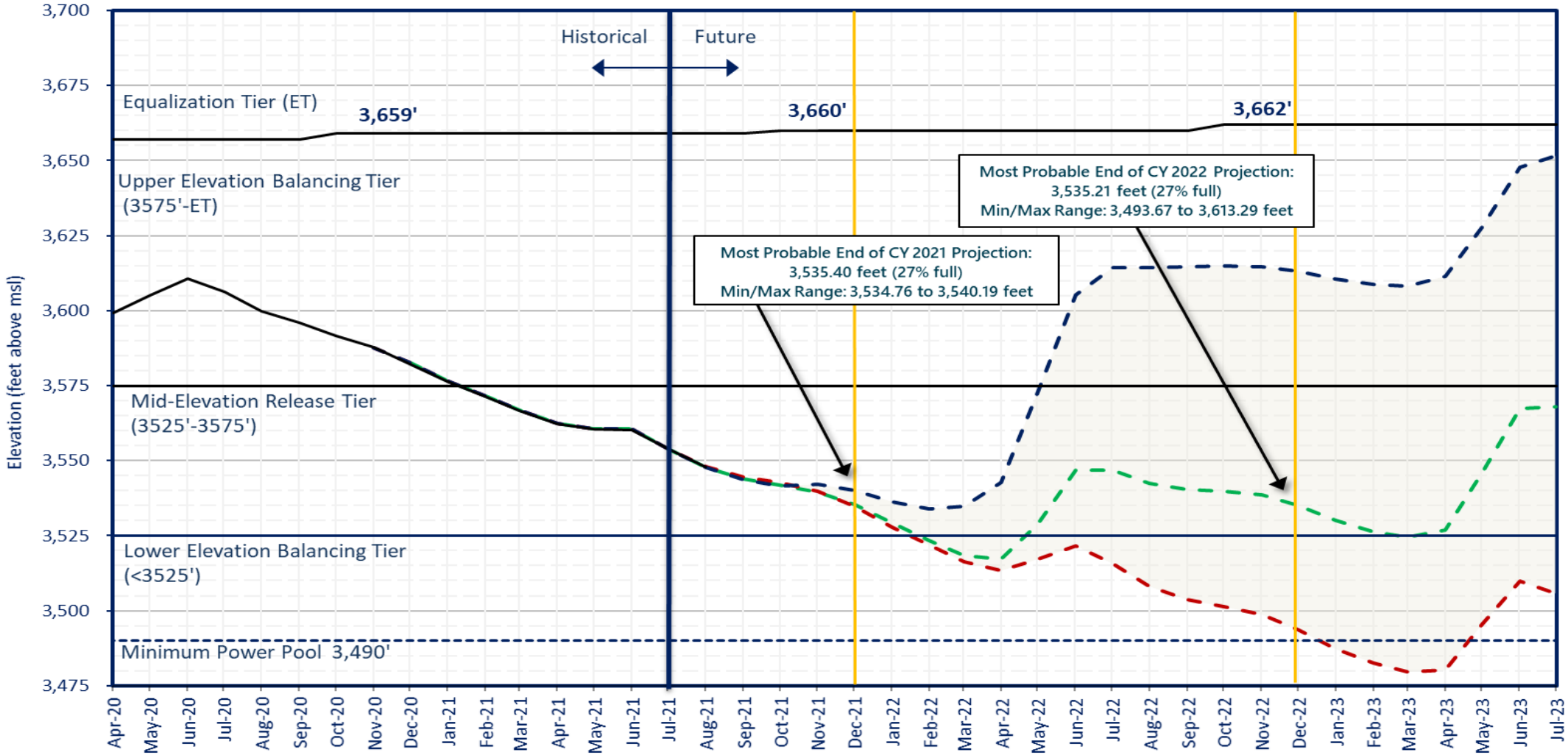
Lake Powell End of Month Elevations

Projections from the August 2021 24-Month Study Inflow Scenarios



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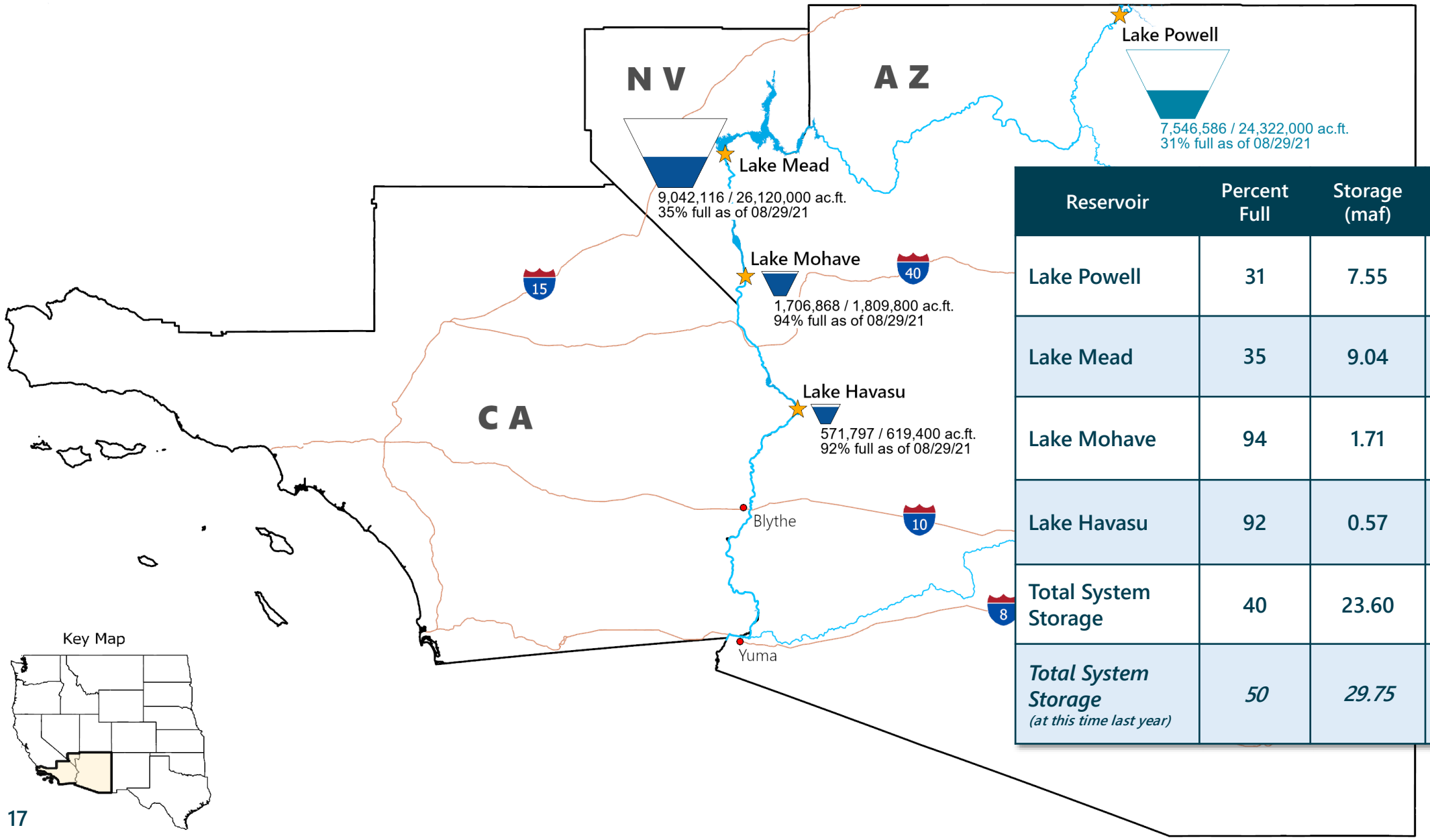
- August 2021 Most Probable - Lake Powell release of 8.23 maf in WY2021 and 7.48 maf in WY2022
- August 2021 Minimum Probable - Lake Powell release of 8.23 maf in WY2021 and 7.48 maf in WY2022
- August 2021 Maximum Probable - Lake Powell release of 8.23 maf in WY2021 and 7.48 maf in WY2022
- Historical Elevations

Lower Colorado Basin

System Conditions and Operations Update

Lower Colorado Basin System Conditions (as of August 29, 2021)



Reservoir	Percent Full	Storage (maf)	Elevation (feet)
Lake Powell	31	7.55	3,549.46
Lake Mead	35	9.04	1,068.01
Lake Mohave	94	1.71	643.30
Lake Havasu	92	0.57	447.57
Total System Storage	40	23.60	-
Total System Storage (at this time last year)	*50*	*29.75*	-

Lower Basin Side Inflows – WY/CY 2021[1,2]

Intervening Flow from Glen Canyon to Hoover Dam

Month in WY/CY 2021		5-Year Average Intervening Flow (kaf)	Observed Intervening Flow (kaf)	Observed Intervening Flow (% of Average)	Difference From 5-Year Average (kaf)
Observed	October 2020	58	35	60%	-23
	November 2020	71	56	79%	-15
	December 2020	67	59	88%	-8
	January 2021	95	72	75%	-23
	February 2021	97	55	57%	-42
	March 2021	111	33	30%	-78
	April 2021	81	36	45%	-45
	May 2021	50	28	55%	-23
	June 2021	29	-13	-46%	-42
	July 2021	64	93	146%	29
Projected	August 2021	81			
	September 2021	71			
	October 2021	58			
	November 2021	71			
	December 2021	67			
	WY 2021 Totals	876	606	69%	-271
	CY 2021 Totals	876	653	74%	-224

[1] Values were computed with the LC's gain-loss model for the most recent 24-month study.

[2] Percents of average are based on the 5-year mean from 2016-2020.

Lake Powell & Lake Mead Operational Table

Lake Mead Operating Condition Determination for Calendar Year 2022[1]

Lake Powell			Lake Mead		
Elevation (feet)	**Operation According to the Interim Guidelines**	**Live Storage (maf)[1]**	**Elevation (feet)**	**Operation According to the Interim Guidelines**	**Live Storage (maf)[1]**
3,700	**Equalization Tier** Equalize, avoid spills or release 8.23 maf	24.3	1,220	**Flood Control Surplus or Quantified Surplus Condition** Deliver > 7.5 maf	25.9
3,636 - 3,666 (2008-2026)	**Upper Elevation Balancing Tier[3]** Release 8.23 maf; if Lake Mead < 1,075 feet, balance contents with a min/max release of 7.0 and 9.0 maf	15.5 - 19.3 (2008-2026)	1,200 (approx.)[2]	**Domestic Surplus or ICS Surplus Condition** Deliver > 7.5 maf	22.9 (approx.)[2]
3,575	**Mid-Elevation Release Tier** Release 7.48 maf; if Lake Mead < 1,025 feet, release 8.23 maf	9.5	1,145	**Normal or ICS Surplus Condition** Deliver ≥ 7.5 maf	15.9
3,525	**Lower Elevation Balancing Tier** Balance contents with a min/max release of 7.0 and 9.5 maf	5.9	1,105		11.9
3,490		4.0	1,075	**Shortage Condition** Deliver 7.167[4] maf	9.4
3,370		0	1,050	**Shortage Condition** Deliver 7.083[5] maf	7.5
			1,025	**Shortage Condition** Deliver 7.0[6] maf Further measures may be undertaken[7]	5.8
			1,000		4.3
			895		0

1,065.85 ft
Jan 1, 2022
Projection

Diagram not to scale

[1] Acronym for million acre-feet

[2] This elevation is shown as approximate as it is determined each year by considering several factors including Lake Powell and Lake Mead storage, projected Upper Basin and Lower Basin demands, and an assumed inflow.

[3] Subject to April adjustments which may result in a release according to the Equalization Tier

[4] Of which 2.48 maf is apportioned to Arizona, 4.4 maf to California, and 0.287 maf to Nevada

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[7] Whenever Lake Mead is below elevation 1,025 feet, the Secretary shall consider whether hydrologic conditions together with anticipated deliveries to the Lower Division States and Mexico is likely to cause the elevation at Lake Mead to fall below 1,000 feet. Such consideration, in consultation with the Basin States, may result in the undertaking of further measures, consistent with applicable Federal law.

[1]Lake Mead operational condition determination is based on the August 2021 24-Month Study projections.

Lower Basin Reservoir Operations
Calendar Year 2022

- Lake Mead will be operated consistent with the 2007 Interim Guidelines, the Lower Basin DCP, and Minute 323
  - Lake Mead will operate in a Shortage Condition in CY 2022 with reductions in accordance with the 2007 Interim Guidelines and Minute 323
  - Water savings contributions required in accordance with the Lower Basin DCP and Minute 323
  - ICS and system conservation water are projected to be created
  - Delivery of ICS may be requested
- Lake Mohave and Lake Havasu will operate consistent with each reservoir's respective elevation guide curves

2007 Interim Guidelines, Minute 323, Lower Basin Drought Contingency Plan, and Binational Water Scarcity Contingency Plan

Total Volumes (kaf)

Lake Mead Elevation (feet msl)	2007 Interim Guidelines Shortages		Minute 323 Delivery Reductions	Total Combined Reductions	DCP Water Savings Contributions			Binational Water Scarcity Contingency Plan Savings	Combined Volumes by Country *US: (2007 Interim Guidelines Shortages + DCP Contributions)* *Mexico: (Minute 323 Delivery Reductions + Binational Water Scarcity Contingency Plan Savings)*					Total Combined Volumes
	AZ	NV	Mexico	***Lower Basin States + Mexico***	AZ	NV	CA	Mexico	*AZ Total*	*NV Total*	*CA Total*	*Lower Basin States Total*	*Mexico Total*	***Lower Basin States + Mexico***
1,090 - 1,075	0	0	0	***0***	192	8	0	41	192	8	0	*200*	*41*	***241***
1,075 - 1050	320	13	50	***383***	192	8	0	30	512	21	0	*533*	*80*	***613***
1,050 - 1,045	400	17	70	***487***	192	8	0	34	592	25	0	*617*	*104*	***721***
1,045 - 1,040	400	17	70	***487***	240	10	200	76	640	27	200	*867*	*146*	***1,013***
1,040 - 1,035	400	17	70	***487***	240	10	250	84	640	27	250	*917*	*154*	***1,071***
1,035 - 1,030	400	17	70	***487***	240	10	300	92	640	27	300	*967*	*162*	***1,129***
1,030 - 1,025	400	17	70	***487***	240	10	350	101	640	27	350	*1,017*	*171*	***1,188***
<1,025	480	20	125	***625***	240	10	350	150	720	30	350	*1,100*	*275*	***1,375***

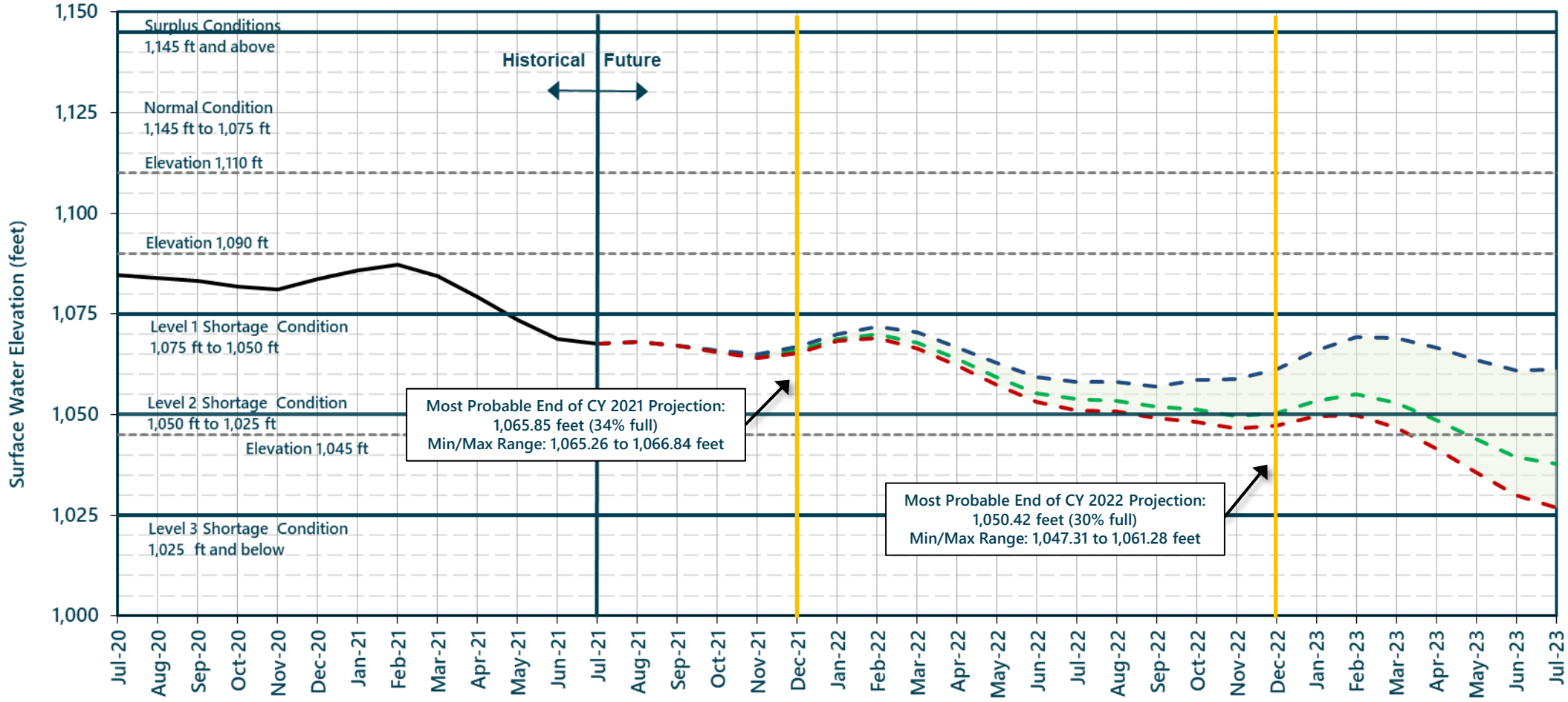
2022 Reductions + Contributions

2022 Reductions + Contributions

The Secretary of the Interior will take affirmative actions to implement programs designed to create or conserve 100,000 acre-ft per annum or more of Colorado River System water to contribute to conservation of water supplies in Lake Mead and other Colorado River reservoirs in the lower basin. All actions taken by the United States shall be subject to applicable law, including availability of appropriations.

Lake Mead End of Month Elevations

Projections from the August 2021 24-Month Study Inflow Scenarios



Historical Elevations

August 2021 Most Probable Inflow with a Lake Powell release of 7.48 maf in WY 2022 and WY 2023

August 2021 Maximum Probable Inflow with a Lake Powell release of 7.48 maf in WY 2022 and 9.00 maf in WY 2023

August 2021 Minimum Probable Inflow with a Lake Powell release of 7.48 maf in WY 2022 and 7.00 maf in WY 2023

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Projected Lake Mead Operational Tiers

Based on August 2021 24-Month Study Inflow Scenarios

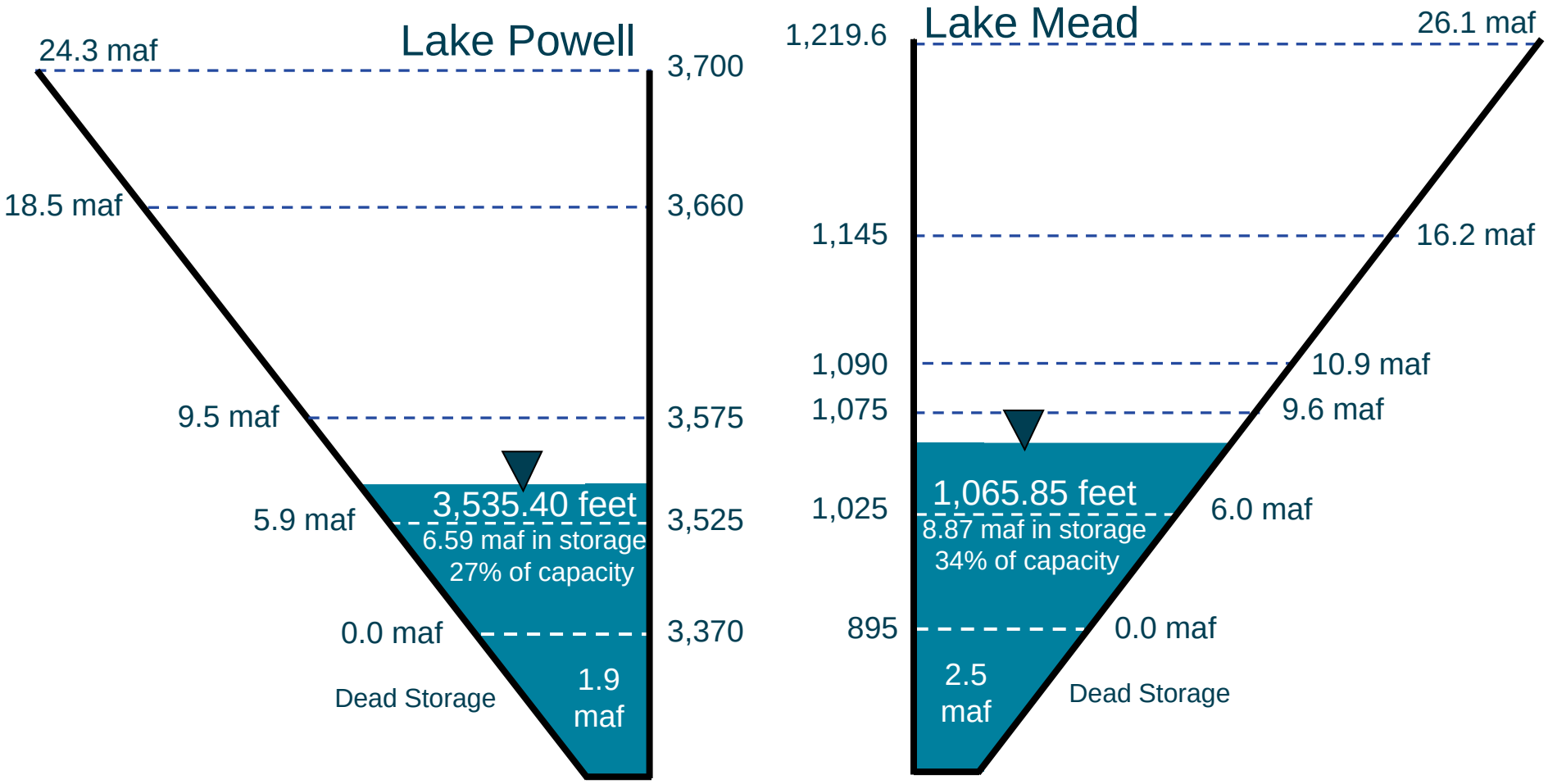
Inflow Scenario	CY 2022 Jan 1, 2022 Projection	CY 2023 Jan 1, 2023 Projections
Probable Maximum	Level 1 Shortage Condition+ Water Savings Contributions[1] Elevation 1,065.85 ft	Level 1 Shortage Condition+ Water Savings Contributions[1] Elevation 1,061.28 ft
Most Probable		Level 1 Shortage Condition+ Water Savings Contributions[1] Elevation 1,050.42 ft
Probable Minimum		Level 2 Shortage Condition+ Water Savings Contributions[1] Elevation 1,047.31 ft

[1]Water savings contributions consistent with the 2019 Colorado River Drought Contingency Plans and Section IV of IBWC Minute No. 323.

End of Calendar Year 2021 Projections

August 2021 24-Month Study Most Probable Inflow Scenario[1]

Based on a Lake Powell release of 8.23 maf in WY 2021 and 7.48 maf in WY 2022



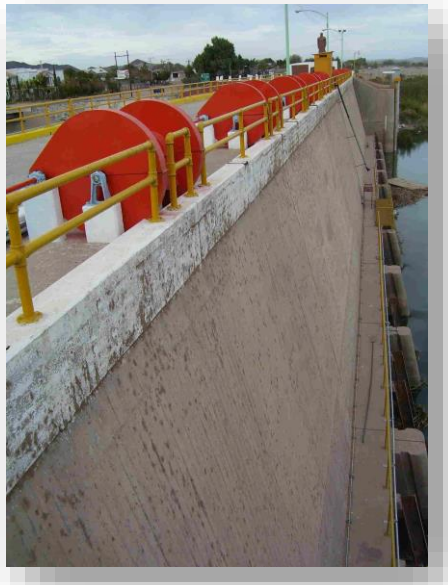
Not to Scale

[1] *WY 2021 unregulated inflow into Lake Powell is based on the CBRFC forecast dated 8/2/21.*

Additional Operational Data
Provisional 2021 Year-to-Date Totals

- Mexico Excess Flows
  - ➢20,973 af (through 8/29)

- Brock Reservoir Total Storage
  - ➢86,285 af (through 8/26)
- Senator Wash Total Storage
  - ➢51,364 af (through 8/26)



YAO Operations Update

- Pumped drainage return flows from the Wellton-Mohawk Irrigation and Drainage District
  - Flow at station 0+00 on the Main Outlet Drain from January through July 2021 was 58,225 ac-ft at 2,716 ppm
- Provisional drainage flows to the Colorado River
  - From the South Gila Drainage Wells January through July 2021 was 6,547 ac-ft at 1,595 ppm
  - From the Yuma Mesa Conduit January through July 2021 was 15,185 ac-ft at 1,123 ppm

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Colorado River Management Work Group

Final Consultation

August 31, 2021

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